A Brief Introduction to The Use of Hospital Discharge Data System

Introduction

Quarterly, each hospital licensed by the Tennessee Department of Health reports, by law (Tennessee Code Annotated, Section 68-1-108), selected information on each inpatient discharged during the period for inclusion in the Tennessee Hospital Discharge Data System (HDDS). Additionally, data from each emergency room visit and ambulatory surgery performed at the hospital are submitted. Excluded from reporting are federal hospitals and mental health facilities licensed by the Department of Mental Health and Developmental Disabilities.

The annual number of reported records is approximately 800,000 inpatient and 2.5 million outpatient bills. The data elements contained in each record are contained in Appendix A. The reported data include most of the items from the standard hospital billing form (UB-92) including: diagnosis, type of units of service (i.e. room charge, x-ray, etc.), procedures performed, charges, sex, and age.

Given the large number of records and the high level of detail, the HDDS can provide a unique look at patient demographics, disease diagnosis, treatment procedures, charges, sources of payment, and patient origin and destination. The purpose of this report is to give potential users of hospital discharge information an example of how the data can be used to profile a specific health problem - in this case, diabetes.

A basic, but important, tool to explore disease patterns in Tennessee is information from death certificates. However, only a glimpse can be drawn from this data about the impact of disease on today's population.

A better tool is HDDS information. Inpatient and emergency room hospitalization data give counts and characteristics of those fighting the disease but requiring hospital support. Information provided by hospital discharge data complements that from death certificates and gives a more accurate picture of the incidence and prevalence of a disease.

Hospitalizations are a major component in the cost of health care, one of the major public policy issues of our time. This information is important to public health researchers, but is of special interest to business analysts, and should be useful for making informed decisions about health care.

In addition to the questions of who, what, where, and when, an answer to "how much?" can be provided by HDDS data as well. Charge data (sticker price, not the actual price paid to the hospital) is available for service categories as well as the entire confinement. The hospital's resource "cost" of a particular disease can be calculated.

As stated, the purpose of this report is to give a brief introduction to the uses of hospital discharge data. To do so, seven tables of diabetes-related hospital discharge data are presented and discussed in seven corresponding sections of text.

Section 1

Table 1 shows Tennessee resident inpatient discharges from 1997 through 1999 having a diagnosis of diabetes by region and age. Diabetes discharges are defined as those with an International Classification of Disease Version 9 Clinical Modification (ICD-9-CM) code of 250 in the principal diagnosis field. The principal diagnosis field indicates the primary condition for which the patient was in the hospital. Besides the principal diagnosis, each discharge record can have up to eight other diagnoses.

The International Classification of Disease Version 9 Clinical Modification (ICD-9-CM) is an extension of the ICD-9 coding system used worldwide to categorize disease. In Tennessee the ICD-9 coding system was used from 1979 to 1998 to code the cause of death on death certificates. The clinical modification of ICD-9 was developed for United States hospitals in order to give additional codes needed for patient diagnosis and care. In some cases, the clinical modification provides additional digits to the ICD-9 code to give a more detailed diagnosis.

The clinical modification also adds a set of codes, called "V-codes" because they begin with the letter V rather than a numeric digit. V-codes are used to indicate that the patient was admitted for some other reason than a disease diagnosis. For example, V22.0 indicates "Supervision of normal first pregnancy."

Another set of codes, called "E-codes" are also used in hospital discharge data. These codes are used in trauma cases, poisonings, and the like to indicate the external source. For example, the standard ICD-9-CM code might indicate a broken leg, whereas the associated E-code would indicate the injury resulted from a car crash. A separate field is provided on the UB-92 for E-codes.

Table 1 is based on those persons diagnosed with diabetes who are also Tennessee residents. That is, only diabetes patients with a Tennessee address are included. Discharge information is also collected on persons living outside Tennessee but is not included here.

Region and county are both determined from the patient's zip code. Age group is based on the patient's age in years, using date of birth and date of admission. Besides age and residence, the other patient demographics available in the hospital discharge data include gender and race.

TABLE 1
Tennessee Hospital Discharges With a Diabetes Diagnosis
By Age, By Health Department Region
With Rates Per 1,000 Population
Resident Data, 1997-1999

Region*	Total	0-19	NUMBER Age Group 20-64	65 and older	Unknown
Total	27,291	2,138	16,215	8,928	10
Northeast Tennessee	1,611	141	911	558	1
East Tennessee	2,908	187	1,657	1,064	-
Southeast Tennessee	1,375	101	839	434	1
Upper Cumberland	1,764	97	936	730	1
Mid Cumberland	2,853	284	1,713	856	-
South Central	1,907	144	1,093	670	-
Northwest Tennessee	1,611	134	903	574	-
Southwest Tennessee	1,360	114	784	461	1
Memphis/Shelby	4,502	375	2,797	1,327	3
Davidson	3,146	189	2,054	902	1
Knox	1,494	98	867	528	1
Hamilton	1,521	145	923	452	1
Madison	469	49	285	135	-
Sullivan	719	75	421	223	-
Unknown	51	5	32	14	-

Region*	Total	0-19	RATE Age Group 20-64	65 and older
Total	5.0	1.4	5.1	12.6
Northeast Tennessee	5.3	1.9	5.0	11.6
East Tennessee	4.6	1.1	4.4	11.5
Southeast Tennessee	4.9	1.4	5.0	10.9
Upper Cumberland	6.1	1.3	5.7	15.9
Mid Cumberland	3.6	1.2	3.6	11.1
South Central	5.7	1.5	5.7	13.9
Northwest Tennessee	6.5	2.0	6.5	13.6
Southwest Tennessee	5.6	1.6	5.7	13.1
Memphis/Shelby	5.2	1.4	5.6	14.5
Davidson	5.9	1.3	6.3	15.2
Knox	4.0	1.0	3.9	10.9
Hamilton	5.2	1.8	5.3	10.6
Madison	5.5	1.9	5.9	11.7
Sullivan	4.8	2.1	4.7	9.2

*See Appendix B, Counties by Health Department Regions

Section 2

Table 2, like Table 1, shows Tennessee resident discharges from 1997 through 1999 with a diagnosis of diabetes. However, the data is shown by admission source and year of discharge. Several other dates relating to patient care are collected. These include month and day of discharge and date of admission.

Admission source indicates how the patient came to be in the hospital. Most were physician referrals or from the emergency room. There is also a special set of codes for newborns.

While admission source tells how patients were admitted to the hospital, the patient status field tells where they go after leaving the hospital. Most are discharged for home recovery, but there are other possibilities: some patients die; others are transferred to another hospital, to a hospice, or to a nursing home; some are sent home, but return for outpatient care; some receive home health care; and there are many other possibilities.

Section 3

Table 3 is broken into three categories or groups. Each category shows a breakdown of discharges by race and gender. The first group is the total of the second and third categories. It shows all Tennessee recorded diabetes discharges. The second group shows this breakdown for Tennessee residents. These 27,291 discharges are the same as shown in the first and second tables discussed earlier. The third group shows an additional 2,565 discharges. These are persons seen in Tennessee hospitals who do not live in Tennessee.

TABLE 2
Tennessee Hospital Discharges With A Diabetes Diagnosis
By Admission Source, By Year of Discharge
Resident Data, 1997-1999

Source	Total	Discharged in 1997	Discharged in 1998	Discharged in 1999
Total	27,291	8,889	9,125	9,277
Physician Referral	11,096	3,710	3,660	3,726
Clinic Referral	438	165	170	103
HMO Referral	10	4	3	3
Transfer from Acute Care Facility	433	176	124	133
Transfer from Skilled Nursing Facility	75	27	27	21
Transfer from other Health Facility	71	29	20	22
Emergency Room	14,951	4,721	5,049	5,181
Court/Law Enforcement	6	1	1	4
Unknown	211	56	71	84

TABLE 3
Tennessee Hospital Discharges With A Diabetes Diagnosis
By Race and Gender, By Place of Residency
1997-1999

	Total	Tennessee Resident	Tennessee Non-Resident
Total	29,856	27,291	2,565
White	19,493	17,897	1,596
White Male	9,169	8,355	814
White Female	10,321	9,539	782
Unknown	3	3	-
Black	8,562	7,846	716
Black Male	3,812	3,485	327
Black Female	4,744	4,355	389
Unknown	6	6	-
Other Races	273	235	38
Other Male	132	111	21
Other Female	141	124	17
Unknown Race	1,528	1,313	215
Unknown Male	710	609	101
Unknown Female	818	704	114

For some purposes, it is better to use the Tennessee resident discharges only; for other purposes, it is better to use all recorded discharges. In general, in dealing with concerns for the health of Tennesseans, it is better to only use the Tennessee resident discharges. For most public health concerns, this is the appropriate set of records. However, if the focus is on the health care industry, i.e. from a business perspective, then it usually makes more sense to use all of the recorded discharges.

Discharge information on Tennessee residents hospitalized outside of Tennessee is not included in HDDS data. For public health purposes especially, it would be very useful to have this information. However, Tennessee only requires reporting by Tennessee hospitals.

Nationally there is a system in place for the exchange of birth and death records among the states. Records collected in one state concerning the residents of another are shared with the resident state. But there is no such system for hospital discharge records. Furthermore, some states do not collect hospital discharge data.

Finally, HDDS data for some counties may not represent the hospitalization experience of the residents. Given the absence of a local hospital and proximity to another state, residents of border counties may use hospitals in other states. Also, many active and retired military personnel use federal hospitals in Tennessee that are not required to report information to the Department of Health for inclusion in the HDDS. Some of the variation in rates in Table 1 may be reflective of this, such as South Central's rate of 5.7 discharges per 1,000 may actually be higher due to residents of this region using hospitals of border states.

Section 4

Table 4 shows all Tennessee discharges from 1997 through 1999 having a diagnosis of diabetes. These are the same discharges shown in Table 3.

All of these discharges have the same ICD-9-CM principal diagnosis code (250) as the first three tables. However, here a breakdown is presented by the value of the fourth digit of the code which provides detail concerning complications commonly associated with diabetes.

In addition to the number of cases as shown in previous tables, Table 4 presents some new information. The average (mean) charge and length of stay are both shown for all diabetes discharges and then for each value of the fourth digit separately.

This charge is the base charge for the hospitalizations. This is not necessarily the actual charge made to the patient or his insurer. Many insurance plans have arranged discounts for their patients. Also HMO patients are often paid for on a capitated basis, not on the basis of actual hospital stays. Nevertheless the hospital's base charge is useful for comparison. It is the only generally available figure for making such case by case comparisons. Note the vast difference in charge between the least expensive category of discharge ($4,036.72) and the most expensive ($17,801.67).

Length of stay is a measurement of the time spent in the hospital. It is based on the date of admission and the date of discharge. This too varies considerably by complication from a minimum of 3.17 days to a maximum of 9.26.

The hospital discharge data set contains two other fields that are at times useful for understanding the economics of health care. One shows the patient's relationship to the insured individual. For example, spouse, child, grandchild etc. Of course the patient and the insured person can be the same. Another field shows the employment status of the insured individual.

TABLE 4
**Tennessee Hospital Discharges With A Diabetes Diagnosis
By fourth Digit ICD-9-CM Code, By Average Charge
And Average Length Of Stay, Recorded Data
1997-1999**

Principal Diagnosis	Cases	Average Charges	Average Length of Stay
Total	29,856	$9,035.91	5.15
Without Mention of Complication (250.0)	6,202	$4,237.72	3.54
With Ketoactidosis (250.1)	7,385	$7,109.72	3.84
With Hyperosmolarity (250.2)	692	$9,658.95	5.27
With Other Coma (250.3)	404	$12,050.73	5.91
With Renal Manifestations (250.4)	1,907	$17,738.95	6.60
With Ophthmalic Manifestations (250.5)	178	$6,578.46	3.17
With Neurological Manifestations (250.6)	3,901	$9,479.84	5.83
With Peripheral Circulatory Disorders (250.7)	3,413	$17,801.67	9.26
With Other Specified Manifestations (250.8)	5,101	$8,616.72	5.34
With Unspecified Complication (250.9)	673	$4,036.72	3.99

TABLE 5
Tennessee Hospital Discharges With A Diabetes Diagnosis
By Fifth Digit ICD-9-CM 250 Code, with percent of Total
Resident Data, 1997-1999

	Number	Percent
Total......................................	27,291	100.0
Adult onset, or unspecified type, not stated as uncontrolled	5,614	20.6
Juvenile, not stated as uncontrolled	7,230	26.5
Adult onset, or unspecified as uncontrolled	6,275	23.0
Juvenile, uncontrolled	8,172	29.9

APR-DRG groups are generated by software from the 3M Company. Each inpatient discharge record is analyzed based on its primary and other diagnoses and on the procedures used in treating the patient. Records are then assigned to groups for which similar types and amounts of treatment are needed. This allows for better comparisons of similar cases in terms of cost and efficacy of care. APR-DRGs are generated for cases during the final processing of records.

Section 5

When a principle diagnosis is coded to the 250 (diabetes) group, a fifth-digit sub-classification is available to identify the type of diabetes and whether it was under control. The fifth-digit allows identification of whether the diabetes was juvenile or adult onset and whether the disease is under control or uncontrolled. Using this information, Table 5 was constructed. Fifth-digits associated with a diagnosis code are frequently used in ICD-9-CM but not for every classification.

Section 6

Table 6 shows all Tennessee discharges from 1997 through 1999 having an All Patient Refined-Diagnosis Related Group (APR-DRG) of 420, the code for diabetes. Note that the number of discharges here (18,409) differs considerably from the equivalent number of discharges (29,856) for ICD-9-CM of 250, diabetes.

The remaining 11,447 patients with a principal diagnosis of 250 are assigned to other APR-DRGs. Many are assigned based on amputations, surgeries, or other procedures performed on the patient. Others are assigned to categories relating to circulatory, kidney, urinary, or nervous disorders.

The data table here shows the 18,409 discharges for APR-DRG 420 broken down by payer and severity of illness. Severity relates to the amount of treatment and resources needed for these cases. Another breakdown available with APR-DRGs is risk of mortality, which relates to the probability of mortality for these cases. Each set of severity of illness and risk of mortality codes is generated specific to the particular APR-DRG. They are not comparable across APR-DRGs.

Payer, in this table, indicates the principal source of payment for the patient's hospital bill. The population of patients includes both the TennCare and Medicare populations for which data is available from other sources. The HDDS has data for these two groups, as well as the rest of the patient population, allowing comparisons among these various groups. Note that the Medicare population has a disproportionate share of the major and extreme cases. This is due to the Medicare population containing predominantly elderly patients.

TABLE 6
Tennessee Hospital Discharges With A Diabetes
Diagnosis, By Payer, By Severity Of Illness
For APR-DRG 420, Recorded Data, 1997-1999

Payer	Total	Severity			
		Minor	Moderate	Major	Extreme
Total......................................	18,409	6,178	9,344	2,516	371
TennCare	4,595	1,259	2,771	493	72
Medicare	6,615	2,414	2,625	1,363	213
Self Pay	828	242	498	79	9
Other Insurance	5,465	1,983	2,937	477	68
Free Care	339	121	184	34	-
Other/Unknown	567	159	329	70	9

Section 7

Table 7 shows a totally different set of discharges than those shown in the first six. These are patients with a principal diagnosis of either cardiovascular, renal, or eye disease. The other eight diagnosis fields are checked for the ICD-9-CM code 250, and if found the discharge is categorized as "yes" if diabetes present.

This table shows how co-morbidities and contributing conditions can be analyzed in conjunction with the principal diagnosis of the patients, and shows the use of differing diagnoses together. Another approach, which would be quite feasible, would be to show diagnoses associated with the use of a particular treatment procedure. For example, lower limb amputations could be shown together with the presence or absence of a principal (and/or other) diagnosis of diabetes.

Conclusion

The purpose of this report was to give a brief introduction to the uses of hospital discharge data. To do so, seven tables of diabetes-related hospital discharge data were presented and discussed in seven corresponding sections of text.

The various kinds of information present in the data were examined: basic patient demographics, disease diagnoses, treatment procedures, charges and sources of payment, and patient origin and destination. Of course, the various fields presented can be used in many other ways than shown here. They can be "mixed and matched" to suit the needs of the researcher. For example, the charge and length of stay data presented in Table 4 can be presented by payer or by patient demographics. The data can be viewed using simple tables as presented here, and they can be subjected to sophisticated statistical analyses as well. It's all up to you, the user, to decide.

TABLE 7
Tennessee Hospital Discharges With Selected
Diabetes-Related Conditions With
Presence Or Absence Of Diabetes
By Gender, 1997-1999

Diagnosis	Total	Male	Female
Cardiovascular Disease			
Total	432,878	218,897	213,852
Yes	110,681	51,413	59,233
No	322,197	167,484	154,619
Renal Disease			
Total	26,268	9,544	16,719
Yes	4,872	1,773	3,098
No	21,396	7,771	13,621
Eye Disease			
Total	2,746	1,351	1,395
Yes	416	175	241
No	2,330	1,176	1,154

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Appendix A

Current Data Elements

Patient Control Number

Type of Bill

Federal Tax Number

Federal Tax Sub ID Number

Statement Covers Period

Address: State of Patient

Address: City of Patient

Address: Zip Code of Patient

Birth Date of Patient

Sex of Patient

Admission Date

Type of Admission

Source of Admission

Status of Patient

Medical/Health Record Number

Revenue Codes

Units of Service

Service Date(s)

Total Charges by Revenue Code Category

Classification of Payer(s) (Primary, Secondary, Tertiary)

Provider Number(s) (Primary, Secondary, Tertiary)

Patient's Relationship to Insured(s)

Certificate/SSN/Health Insurance Claim/ID Number (Primary, Secondary, Tertiary)

Insurance Group Number(s) (Primary, Secondary, Tertiary)

Employment Status Code

Name of Insured's Employer

Zip Code of Insured's Employer

Principal Diagnosis Code

Other Diagnosis Codes

External Cause of Injury Code (E-Code)

Principal Procedure Code

Principal Procedure Date

Other Procedure Codes

Other Procedure Dates

Attending Physician ID Number

Other Physician(s) ID Number

Social Security Number of Patient

Race/Ethnicity of Patient

Appendix B

Counties By Health Department Regions

East Tennessee

Anderson
Blount
Campbell
Claiborne
Cocke
Grainger
Hamblen
Jefferson
Loudon
Monroe
Morgan
Roane
Scott
Sevier
Union

Northeast

Carter
Greene
Hancock
Hawkins
Johnson
Unicoi
Washington

Southeast

Bledsoe
Bradley
Franklin
Grundy
McMinn
Marion
Meigs
Polk
Rhea
Sequatchie

Southwest

Chester
Decatur
Fayette
Hardeman
Hardin
Haywood
Henderson
Lauderdale
McNairy
Tipton

Mid-Cumberland

Cheatham
Dickson
Houston
Humphreys
Montgomery
Robertson
Rutherford
Stewart
Sumner
Trousdale
Williamson
Wilson

South Central

Bedford
Coffee
Giles
Hickman
Lawrence
Lewis
Lincoln
Marshall
Maury
Moore
Perry
Wayne

Northwest

Benton
Carroll
Crockett
Dyer
Gibson
Henry
Lake
Obion
Weakley

Upper Cumberland

Cannon
Clay
Cumberland
Dekalb
Fentress
Jackson
Macon
Overton
Pickett
Putnam
Smith
Van Buren
Warren
White

Memphis/Shelby

Shelby

Jackson/Madison

Madison

Metro/Nashville/Davidson

Davidson

Chattanooga/Hamilton

Hamilton

Knoxville/Knox

Knox

Sullivan

Sullivan